

traversed, are of much interest. The work is well supplied with good maps, and has a number of good and useful illustrations. It is well worth reading.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Dr. Siemens' Solar Hypothesis

I HAVE been waiting for several weeks for answers to the following rather obvious objections to Dr. Siemens' Solar Hypothesis, but I have not seen them either asked by others or answered by Dr. Siemens.

1. How the interplanetary gases near the sun acquire a sufficient radial velocity to prevent their becoming a dense atmosphere round him?

2. Why enormous atmospheres have not long ago become attached to the planets, notably to the moon?

3. Why the earth has not long ago been deluged when a constant stream of aqueous vapour that would produce a rain of more than 30 inches per annum all over the earth must annually pass out past the earth in order to supply fuel to be dissociated by the heat that annually passes the earth?

4. Why we can see the stars although most of the solar radiations are absorbed within some reasonable distance of the sun?

GEO. FRAS. FITZGERALD

40, Trinity College, Dublin, May 16

I HAVE the pleasure to reply to the very pertinent questions put by Prof. FitzGerald as follows:—

1. The gases being for the most part hydrogen and hydrogen compounds have a low specific gravity as compared with the denser gases forming the permanent solar atmosphere. On flashing into flame in the photosphere, their specific gravity would be vastly diminished, thus giving rise to a certain rebound action which coupled with their acquired onward motion, and with the centrifugal impulse they receive by frictional contact with the lower atmosphere, constitutes them a surface stream flowing from the polar to the equatorial regions, and thence out into space. (Lest I should be misunderstood, allow me to add that I do not look upon centrifugal action as sufficing in any way to overcome solar gravitation.) Astronomers are in the habit of regarding each spheroid possessed of an atmosphere as rotating in vacuous space; under such circumstances the atmosphere must partake of the rotatory motion of the solid spheroid, and after having attained an increased depth at the equator, will assume a state of static equilibrium unless disturbed by external influences. No such statical equilibrium is possible, however, if we assume the same spheroid with its atmosphere, surrounded by an ocean of indefinite dimensions, consisting of gaseous matter not partaking of the rotation of the spheroid, although subject to its attractive influence. Equal masses will under those conditions be equally attracted both in the polar and equatorial direction, and the continued disturbance of equilibrium by rotatory motion must result in continuous outflow. Nor need this outflow be accomplished entirely at the expense of rotatory motion of the spheroid because the inflowing polar current when once established, will only have to be changed in direction by frictional action in order to convert it into the outflowing current.

2. Regarding the second question, I assume that the atmosphere of each spheroid in space is precisely such as would result from its mass, and if this view is correct, the moon also must have an atmosphere, though of so attenuated a character as to be scarcely perceptible by means of optical instruments; for as Wollaston put it in his celebrated paper, read before the Royal Society in January 1822, "it would not be greater than that of our atmosphere is, where the earth attraction is equal to that of the moon at her surface, or about 5000 miles from the earth's surface." I am well aware that in assuming atmospheric air to be a perfectly elastic fluid, the atmospheric density would at a height of only 70 kilometers not exceed the 1-7000th part of atmospheric density, and would therefore at greater distances

become inappreciable; but we have evidence to show that Boyle and Mariotte's law holds good only within comparatively narrow limits, and there is other evidence referred to in my paper in favour of the supposition that such gases as are contained in meteorites are diffused through space in appreciable amounts, or the meteorites could not for millions of years have retained these gases, notwithstanding the action of diffusion into empty space.

3. The amount of vapour that would condense upon the earth under the conditions here assumed, would depend upon its mean temperature on the one hand, and on the vapour-density of the stellar atmosphere surrounding it on the other. Assuming the density of the stellar atmosphere, which, while surrounding the earth does not partake of its rotatory motion to be 1-10,000th part of atmospheric density, and saturated with aqueous vapour, the point of condensation would be according to Regnault -50° C., if the outer regions of our atmosphere should be at that temperature, and saturated with aqueous vapour, the two would be in diffusive balance; if they were at a lower temperature they would acquire, and if at a higher they would part with aqueous vapour to the surrounding medium.

4. It has long been held by astronomers that there are stars beyond our range of vision, which hypothesis would involve that of absorption of heat and light rays in stellar space; some rays are more easily absorbed than others; thus it appears to be the yellow rays which are most efficacious in the decomposition of carbonic acid and aqueous vapour in the vegetable cell. May not the same conditions prevail in space, and allow probably the rays of highest refrangibility to pass on to the greatest distance without being absorbed—I should say utilised—in doing chemical work?

C. WM. SIEMENS

12, Queen Anne's Gate, S.W., May 22

Porculia Salvania (Hodgson)

A MOST valuable and interesting addition has recently been made to the Zoological Society's collection in Regent's Park, of four—a male and three females—Pigmy Hogs (*Porculia salvania*, of Hodgson) from the Doars of Bhutan. The extreme rarity and difficulty of procuring this animal makes its presence here of the greatest interest, and these individuals will be examined eagerly, not only by naturalists, but by many Indian travellers, sportsmen, and others, who have heard of, but never had the opportunity of seeing the pigmy hog. My attention was directed to it many years ago by the late Mr. Blyth, then in Calcutta, who on my first expedition to the Nepal Terai, in 1855, requested me to endeavour to obtain a specimen—as far as I remember, neither Blyth nor Jerdon had seen it living—Hodgson, who described and named it, had heard of its existence from the Nepalese or other denizens of the Terai, or neighbouring localities, long before he obtained a specimen. I was unable to procure one, though I made repeated attempts to do so, and enlisted many influential friends in the search, but without success; very few appeared to know even of its existence, whilst many seemed to regard it as mythical. Occasionally I met with natives who said they had heard of it, but I began to fear that it might be extinct. The four fine specimens now in the Gardens prove that such is not the case, and will furnish opportunity of supplementing Hodgson's description of the animal, which is to be found in the *Proceedings* of the Zoological Society, and in Jerdon's "Mammals of India."

These lively little pigs, weighing probably hardly as much as a hare, are most active and energetic; they resemble the ordinary pig in miniature, but probably may have some anatomical peculiarity which will interest naturalists as regards affinity with the Peccaries. The specific designation *Salvania*, is from the Sal (*Shorea Robusta*), as the pig is, I believe, found in that part of the Terai and along the sub-Himalayan tracts, where the Sal tree abounds, and among the long grass in which the little creature hides itself. It is much to be hoped that they will breed, and thus enable other zoological collections to be supplied with specimens of a most rare and interesting species.

J. FAYRER

Pseudo-Glacial Phenomena

I BEG to call the attention of geologists to the following facts:—On the north-east coast of Australia, at the end of Trinity Bay, about lat. 17° S., there are steep ranges of granite abutting on the sea-margin. Every rainy season (December, January, and February) immense quantities of the granite

become loosened from the upper part of the mountains, and fall in extensive landslips down the sides. These landslips or rockslips are so numerous, that in fine weather they are most conspicuous objects on the sides of the hills, and look like dry water-courses. One of these rockslips I witnessed at Cape Grafton, from a distance of three miles. The noise was terrific, and the ground trembled as though from an earthquake. On examining the blocks of granite which had slipped to the bottom of the ravine, I found many of them with their sides grooved and scratched, and one fragment was as beautifully polished on one side as if it came from the hands of a lapidary, excepting, of course, the scratches and grooves. In the course of a few centuries, much of the range will be worn away, and its sides represented by an alluvial deposit mainly consisting of angular boulders of every size and shape, many of which will be polished, scratched, and grooved. There are very few geologists who would not call it a glacial drift, even now, were not the cause so evidently before them. Will this help to explain the so-called drifts, which, like this instance, are found far within the tropics?

T. E. TENISON-WOODS

Union Club, Sydney, N.S.W., March 25

Variability of Number of Sepals, Petals, and Anthers in the Flowers of *Myosurus minimus*

IN my article on "Different Modes of Self-fertilisation where Visits of Insects are wanting" (NATURE, vol. x. p. 129), I gave a short account of the number of sepals, petals, and anthers in a hundred flowers of *Myosurus minimus* examined by myself. Some error must, however, have slipped into this account, the sum of the quoted flowers differing from a hundred. I have, therefore, lately repeated my examination and give here the results. In 200 flowers I now found 35 different proportions in the number of sepals, petals, and anthers. These were contained in—

Flowers	Sepals	Petals	Anthers	Flowers	Sepals	Petals	Anthers
1 ... 4 ... 3 ... 4	2 ... 5 ... 5 ... 3	c					
1 ... 4 ... 3 ... 6	3 ... 5 ... 5 ... 4						
6 ... 5 ... 2 ... 3	7 ... 5 ... 5 ... 5						
4 ... 5 ... 2 ... 4	7 ... 5 ... 5 ... 6						
1 ... 5 ... 2 ... 5	4 ... 5 ... 5 ... 7						
1 ... 5 ... 2 ... 6	3 ... 5 ... 5 ... 8	a					
1 ... 5 ... 3 ... 2	1 ... 6 ... 2 ... 5						
4 ... 5 ... 3 ... 3	1 ... 6 ... 2 ... 6						
10 ... 5 ... 3 ... 4	1 ... 6 ... 2 ... 7						
23 ... 5 ... 3 ... 5	1 ... 6 ... 2 ... 8						
23 ... 5 ... 3 ... 6	1 ... 6 ... 2 ... 10						
24 ... 5 ... 3 ... 7	1 ... 6 ... 3 ... 7						
9 ... 5 ... 3 ... 8	1 ... 6 ... 5 ... 7						
1 ... 5 ... 3 ... 9	1 ... 7 ... 2 ... 7						
6 ... 5 ... 4 ... 4	1 ... 7 ... 3 ... 6						
7 ... 5 ... 4 ... 5		b					
16 ... 5 ... 4 ... 6							
14 ... 5 ... 4 ... 7							
2 ... 5 ... 4 ... 8							
1 ... 5 ... 4 ... 9							

In general, the number of sepals, petals, and anthers increases and decreases with the size of the flower, the 12 first quoted flowers being exceedingly dwarfish ones.

It should further be considered that in combination with a certain number of sepals and petals a certain number of anthers seems to be the normal one, and from this normal (maximum) number of anthers, as to be seen under *a*, *b*, *c*, the numbers of flowers on the two opposite sides are constantly decreasing.

Lippstadt, May 16

HERMANN MÜLLER

"A Dead Heat"

TELEGRAMS from Paris on Monday state that the "Prix du Jockey Club" had resulted in what is usually called a "dead heat." It is unnecessary for me to inform you, that there can be no such thing as a "dead heat." It is called so, I suppose, in consequence of a disagreement among the judges as to which horse first thrusts his nose beyond the winning-post. Are living judges any longer necessary to determine the results of a race? Five years ago I proposed to prove by indisputable evidence the winner of a trotting match which, in consequence of a dispute among the judges, had to be trotted over again. By means of a single thread stretched across the track, and invisible to either horses or their riders, twenty

photographic cameras have been made to synchronously record positions impossible for the eye to recognise. With the aid of photography, the astronomer, the pathologist, the chemist, and the anatomist are enabled to pursue the most complex investigations with absolute confidence in the truth it reveals; why should those interested in trials of speed not avail themselves of the same resources of science? I venture to predict, in the near future that no race of any importance will be undertaken without the assistance of photography to determine the winner of what might otherwise be a so-called "dead heat."

449, Strand, W.C., May 23

EDWARD MUYBRIDGE

Aurora Borealis

THE auroral display mentioned by your two correspondents was particularly brilliant at Oldham on the evening of the 14th inst., at 11.10. I observed at 11.15 one very fine streamer reaching quite to the Pole Star; it was of a ruddy hue, dull, and changing to purple. The horizon was cloudy, the cloud being fringed with white light, changing to rose colour. The constellation Cassiopea was at times covered with a mass of light, from whence the streamer arose, lighting up the whole of the northern sky.

Oldham

W. PULLINGER

Bright Meteors

1882, May 16, 11h. om. G.M.T. Meteor many times brighter than Venus; green, then white; began of second magnitude, 5° above main cluster of *Coma*; passed 1½° above *Iota Urs. Maj.*, where it changed colour suddenly; ended, of second magnitude, 5° left of *Beta Aurigæ*. Duration 8 seconds, may have been 10. No streak. Observed from the University Observatory. A few minutes later another was seen describing very nearly the same path.

Oxford

G. L. TUFMAN

Curious Formation of Ice

IN your issue of November 24, 1881 (vol. xxv. p. 78) Mr. J. F. Duthie described small wafer-like, rather funnel-shaped pieces of ice which he noticed in October, on the slopes of the Himalayas, and asked whether such forms of ice had been observed elsewhere.

On November 30, 1881, I observed, at a height of about 7000 feet, near the hill station of Chakrata, on the outer Himalayas, ice crystals which were grouped in bundles about one inch long and one inch in diameter. The bundles consisted of prisms up to a quarter of an inch diameter, and looked at from the side the long parallel prismatic faces, and the short rectangular outlines of the ends of the prisms suggested rather the orthorhombic system of crystallisation. On looking straight at the end of the crystals, it was, however, seen that all the prisms were hexagonal, and that they ended in hollow hexagonal pyramids, thus bringing out clearly the hexagonal system of crystallisation to which ice belongs.

The hollow hexagonal pyramids showed further development in other portions of the hoar frost, and there seems very little doubt that what Mr. Duthie describes were accumulations of small crystals originally grouped in the shape of hexagonal hollow pyramids, but more or less expanded and rounded off.

I may here mention another interesting occurrence of crystals which I had the opportunity of noticing at the salt works in Che-hire. During slow evaporation of brine in a steam-heated reservoir, crystals of salt formed at the surface in the shape of hollow hexagonal pyramids. This is easily explained. Whilst the ordinary well-known hollow salt pyramids with square base form, by the gradual sinking and growth of a cubical nucleus which floats with one pair of faces horizontally placed, these exceptional hexagonal pyramids form from an original cube which floats on the water with a solid angle as its lowest point. The six lateral edges are the beginning of the hexagonal pyramids.

H. WARTH

Dehra Dun, N.W. Provinces, East India, April

The Existence of a Voice in Lizards

THE following may perhaps be of some interest in connection with the letter of Prof. Th. Eimer (vol. xxvi. p. 29). One evening as I sat in the verandah of my house in Madras, my attention was called by a peculiar cry, and on looking